

SEMICONDUCTOR DEVICE WITH GOLD BUMPS, AND  
METHOD AND APPARATUS OF PRODUCING THE SAME

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5 BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a semiconductor device, a method of producing the same, and an apparatus for producing the same.

10 2. Description of the Related Art

With the progress in semiconductor integrated circuits in recent years, semiconductor elements having very many terminals (e.g., not less than 300 terminals) have been placed in the market. Accordingly, it has been strongly demanded to improve the technology for connecting the terminals (electrodes) of a semiconductor element to the terminals (electrodes) of a wiring board, and to reduce the cost.

Technology has been developed for connecting all the electrodes of the semiconductor element to the electrodes of the wiring substrate at one time by utilizing metal bumps. That is, metal bumps such as solder bumps or gold bumps are first attached to the electrodes of the semiconductor element, and the semiconductor element is pressed onto the wiring board, with its face directed downward, so that the metal bumps are joined to the electrodes of the wiring board and the electrodes of the semiconductor element are connected to the electrodes of the wiring board.

The conductors of the integrated circuit of a semiconductor element are formed of aluminum and, hence, the electrodes of the semiconductor elements are generally formed of aluminum. On the other hand, the conductors of a wiring board are composed of copper and, hence, the electrodes of the wiring board are generally formed of copper.

When solder bumps are to be used, a nickel

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